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ABSTRACT

Twenty children diagnosed as mentally retarded (MR) were enrolled in a special training program designed to increase Ss' school-appropriate behaviors by means of the sequential and consequential arrangement of teaching objectives and teaching procedures. A hierarchy of achievement levels was establisned with a sequential and consequential arrangement of 30 behavioral objectives. The behavioral repertoire described by the 30 levels was thought to be comparable to performances asked from a normal child entering a standard first grade classroom. The 20 Ss engaged in a total of 406 sessions, each approximately 10 minutes long. It was reported that a total performance increment of 131 level achievements was attained, that these level achievements required a total teaching time of 51 hours and 24 minutes, and that a total number of 12,817 interactions between student-trainees and Ss were used to establish the achievement levels. All instruction was accomplished by 34 trainees (20 staff members of institutions for the MR, six nursery school teachers, and eight mothers of retarded children) who had previously participated in a 45 hour training program on operant conditioning tactics. The achievement levels and their consequential arrangement were described in detail. (GW)

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Strategies for the sequential and consequential arrangement of school-appropriate behaviors: The establishment of school-appropriate behaviors in normal, retarded and handicapped children through the application of operant tactics.

H. Dieter Blindert

Abstract

School-appropriate behaviors were established in 20 young retarded and handicapped children through the application of strategies for the sequential and consequential arrangement of teaching-objectives, and teaching procedures. The positive findings indicate strongly that the diagnosis of mental retardation does not signify an innate disability to achieve standard performances but must rather be regarded as being function of little or no previous teaching. Teaching has to be defined as that activity which brings about learning. There was no preselection of children for the study. All children for whom admission into the program was requested were accepted. All children's achievement levels were raised.

The fact that children who are classified as mentally retarded or learning disabled do not demonstrate a range of school-appropriate behaviors does not imply that they cannot acquire these behaviors. Operant conditioners have demonstrated that the application of behavioral strategies (Buddenhagen, 1971; Sapon 1966; Risley 1966) will bring about the acquisition of school-appropriate behaviors even in cases of severe retardation.

In most cases that have been presented, a specific behavior was established by a highly skilled experimenters. Often studies have shown that once a specific behavioral strategy has been developed, this strategy can be applied by non-professionals with a minimum of training, (Blindert, 1969; Lindsley, et. al., 1965; Wahler, et. al., 1965).

Little work has been done which shows that one level of performance serves as an introduction to a higher level, etc. Based on the work of (Blindert 1969; Buddenhagen, 1970; Mear, 1969; Sapon, 1965; and 1968; Treichler, 1971)a hierarchy of teaching and learning steps (Achievement Levels) was developed. Each established performance provides the necessary and sufficient conditions for entering a performance on a higher level of stimulus and response complexity. Once the program of the sequential and consequential arrangement of achievement levels had been determined, they were experimentally checked out with several young normal children. Then a training program for professionals (nurses, teachers, ward attendants) and non-professionals (parents) was established with the objective of bringing trainees to apply the program to retarded and handicapped children.

DESCRIPTION OF ACHIEVEMENT LEVELS AND THEIR CONSEQUENTIAL ARRANGEMENT

The levels are arranged in their hierarchial order according to (a) the complexity of the response productions, (b) the complexity of the control presentations, (c) the requirements of the situational context. They take into account that prior to the establishment of a given behavioral objective a situation has to be brought about in which teaching and learning can occur.

The sequential arrangement of the levels is determined by their consequential dependencies. That is, preceding levels are the necessary and sufficient prerequisites for the following level. Each S (child, patient) is given a pretest: prior to any training for each S the level of his performance is determined. The highest performance level (expressed by S's criterion performance with respect to an objective) represents his individual entering level into the program.

The sequence of levels and the strategies (recipes) with their sequentially and consequentially arranged teaching steps are the same from S to S.

Different are the entering level, the time, and the number of responses necessary to go from step to step, from objective to objective.

The objectives are in terms of levels of performance from a low level (non-verbal) to a high level which is comparable to a first grade level.

This hierarchy of levels is used and has been used for normal young children, for retarded and handicapped children, adolescents and adults. Sex,

actual age, mental age, and I.Q. are not to be considered as controlling variables for subjecting S to the hierarchy.

HIERARCHY OF BEHAVIORAL LEVELS

1. 1. Deceleration of Behaviors.

2. Acceleration of Behaviors.

In many instances before the establishment of a behavior can be undertaken a variety of behavioral givens may have to be extinguished, decelerated. Others may have to be brought to a higher behavioral strength.

Example: 1. Tantrums, self-abuse, etc.
2. Self-care, etc.

11. Time and Location

A situation must be established in which teaching or learning can occur. This situation requires first of all that S is brought to remain for a time in a given location.

111. Motor

All organisms move all the time. Some movements support teaching and learning, others do not. S has to be brought to demonstrate that his movements are controlled in the teaching-learning situation.

Example: Movements required in learning settings and in the settings of the ward (sitting).

IV. Attending

All teaching and learning requires that the learner attend to the teacher in a controlled fashion.

Example: Eye-contact.

V. Interaction I (basic)

All teaching and learning requires that the learner interacts with the teacher, that the learner responds.

Example: Any response under any control.

VI. Frequency of Interaction

Teaching and learning requires that interactions occur frequently in a given amount of time.

VII. Interaction II (specific)

Example: A standard response under a standard control.

VIII. Model - Imitation I (motor)

Much teaching depends on the learner's imitations of the teacher's model-presentations. Initially gross motor movements are modelled and imitated, then gradually fine movements are introduced.

IX. Verbal - Receptive Repertoire: Pointing

S can demonstrate many school appropriate repertoires by using his index finger instead of his articulatory apparatus.

Example: Teacher = "where is the red block?"
S = points to the red block and has produced evidence of a colour related repertoire (concept). On step 8 motor model-imitation has been brought about. Step 8 now serves as a baseline for pointing. First the child is brought to imitate index finger movement, then this response is brought under the verbal control of "point". Then, the response is executed toward an object.

X. Matching

Most conceptual responses can be demonstrated by matching stimuli according to their properties. Matching is a complex form of pointing. For instance, the child is presented with 3 objects on the table, a block, a ball, a doll. The experimenter takes a second ball, holds it out to the child and instructs: "Point to the ball in my hand". The child points. The second instruction follows: "Point to the one on the table". At this stage the child is faced with 3 objects on the table, one of which matches the object in the experimenter's hand. The child points to the ball on the table and has demonstrated appropriate discrimination and differentiation. Once this matching routing is established with a number of objects that the child is familiar with, the routine will bring about appropriate responding also in cases where there is no or little familiarity with the stimulus objects. The routine permits the establishment of conceptual repertoires with respect to shape, size, colour, etc.

XI. Object - Matching

XII. Picture - Matching

XIII. Shape - Matching

XIV. Size - Matching

XV. Colour - Matching

XVI. Numeral - Matching

XVII. Graphics - Matching

Reading is introduced in form of matching alphabetical combinations. At this step the child learns to attend to discriminate appropriately and differentiate alphabetical combinations.

XVIII. Model Imitation (vocal I)

So far S has demonstrated a variety of behaviors without using his articulatory repertoire. Standardly, however, verbal-vocal statements have to be demonstrated. A necessary requirement for verbalizations is an established vocal-articulatory repertoire. The basic form of establishing vocal responses is a model-imitation procedure, initially on a sound for sound situation.

XIX. Model - Imitation - (vocal 2)

Syllabic.

XX. Vocalization

Articulations not under the control of a model (vocal operant).

XXI. Verbalization (basic) Controlled

A vocal control is followed by a vocal response. S is verbally controlled. The behaviors that have been established with the matching routine now support the establishment of related vocal-verbal responses.

XXII. Object Related Verbal Repertoire

XXIII. Picture Related Verbal Repertoire

XXIV. Shape Related Verbal Repertoire

XXV. Size Related Verbal Repertoire

XXVI. Colour Related Verbal Repertoire

XXVII. Counting Related Verbal Repertoire

XXVIII. Reading I

Reading of tact- and mand-sentences.

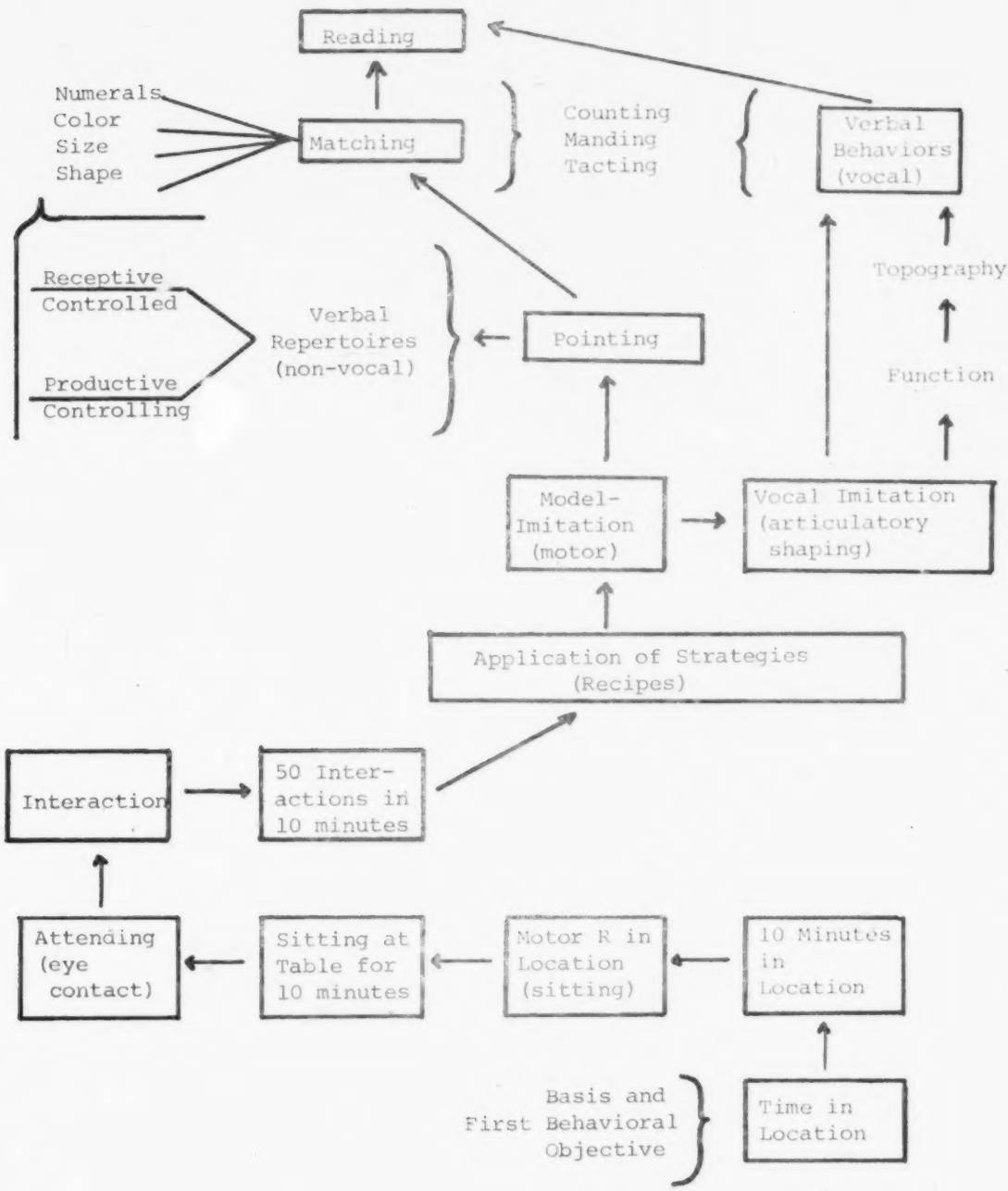
XXIX. Reading II

Following written instructions.

XXX. Verbalization - Controlling

S operates upon his verbal environment by verbal means. S controls his audience.

OVERALL STRATEGY OF THE SEQUENTIAL AND CONSEQUENTIAL ARRANGEMENT OF ACHIEVEMENT LEVELS



HIERARCHY OF ACHIEVEMENT LEVELS

XXX,2	Verbalization: Controlled (Extended Tacts)
1	Verbalization: Controlling (Extended Mands)
XXIX	Reading: R under Control of Written material
XXVIII,2	Reading: Graphic Strings ("Sentences": Mands and Tacts)
1	Reading: Tacts (lexical items)
XXVII,3	Counting: Tacting Number of Objects
2	String Counting
1	Tacting Numerals
XXVI	Tacting Color
XXV	Tacting Size
XXIV	Tacting Shape
XXIII	Tacting Pictures
XXII	Tacting Objects
XXI	Verbalization: Standard Vocal-Verbal C and R
XX	Vocalization: Verbal (Vocal Operant in Experimental Setting)
XIX	Vocal Model Imitation: Syllabic (/CV/,/VC/)
XVIII	Vocal Model Imitation: Vocallic (/V/)
XVII	Matching Graphics
XVI	Matching Numerals
XV	Matching Color
XIV	Matching Size
XIII	Matching Shape
XII	Matching Pictures
XI	Matching Objects
X	Matching (Complex Pointing)
IX	Pointing
VIII,2	Model Imitation: Lip Movement
1	Model Imitation: Hand and Arm Movement
VII	Interaction: Standard Response
VI	Frequency of Interaction
V	Basic Interaction: Any Response, that is situationally appropriate
IV	Attending: Eye Contact
III	Position: Sitting
II	Time in Location
I,2	Acceleration of Behaviors (AC)
1	Deceleration of Behaviors (DC)

Method

Subjects:

Twenty children, all of them "officially" diagnosed as mentally retarded, were subjected to a special training program. The objectives of the program were to raise the children's achievement level with respect to school-appropriate-behaviors.

Procedures:

An hierarchy of achievement levels was established with a sequential and consequential arrangement of 30 behavioral objectives. The behavioral equipment provided by these 30 levels is comparable to performances asked from a normal child when he enters a standard first grade classroom.

For all 20 children their individual entering level was determined. That is, a behavioral investigation specified that level in the hierarchy of achievement levels on which the child was performing at the onset of the program. This level was then taken as the entering level (El) into the program. Entering levels across children were different. For instance, if a child had level 1 through 6 in his repertoire at the onset of the program, level 6 was taken as his entering level, and his first learning-teaching objective was level 7, then 8, etc. Another child may start at level 12 and then proceed. The consequential dependencies on consecutive levels had been tested out in previous programs.

There was no pre-selection of children for the program. All children for whom admission into the program was requested, were accepted.

Teaching took place in sessions in which an individual child (patient) was selectively reinforced for approximations to a criteron response. Once a criterion response was arrived at, a response of a higher order was taken as the next criterion. Sessions had an average duration of 10 minutes.

Results

Twenty patients recieved a total of 406 sessions. In these sessions a total performance increment of 131 level achievements was brought about. The total teaching time used for these level achievements was 3,084 minutes or 51 hours and 24 minutes. A total number of 12,817 interactions between student-trainees and patients were used to establish the achievement levels (see Table 1).

These data yielded a mean of 20.3 sessions per patient with a mean total time of 154 minutes in which a mean of 6.5 novel behavioral repertoires (level achievements) were established. (see Graph 1 and 2).

Two of the children were accepted in normal kindergartens after they had been subjected to the program.

The total time span covered by the Program (including training of student-trainees and work with patients) was 6 weeks, 3 hours per day, 5 days per week.

Concurrent with the training program for the children, a training program for professionals and non-professionals in the area of mental retardation was set up.

Thirty-four trainees (20 staff members of institutions for the mentally retarded, 6 nursery teachers and 8 mothers of retarded children) were accepted as apprentices in the application of operant techniques to the establishment of school-appropriate behaviors in mentally retarded children.

They received a rigorous training in form of an arrangement of demonstration, instruction, assignment to behavioral work, supervision, and review of assignment. This training covered a total time of 45 hours.

All work with the children was undertaken by the trainees. The behavioral results in form of level achievements for the children is solely attributable to the trainees' work, as it was designed and set up by the program. All trainees, "graduated", that is, they raised a child's level of performance.

The "graduated" trainees (after the training program) can be considered to be skillful and knowledgeable in the application of a variety of strategies and tactics that serve the establishment of school-appropriate behaviors in children.

After the program they demonstrated this when they subjected yet untreated patients to the special training program. Again all children without exception moved up on the achivement scale.

Table I

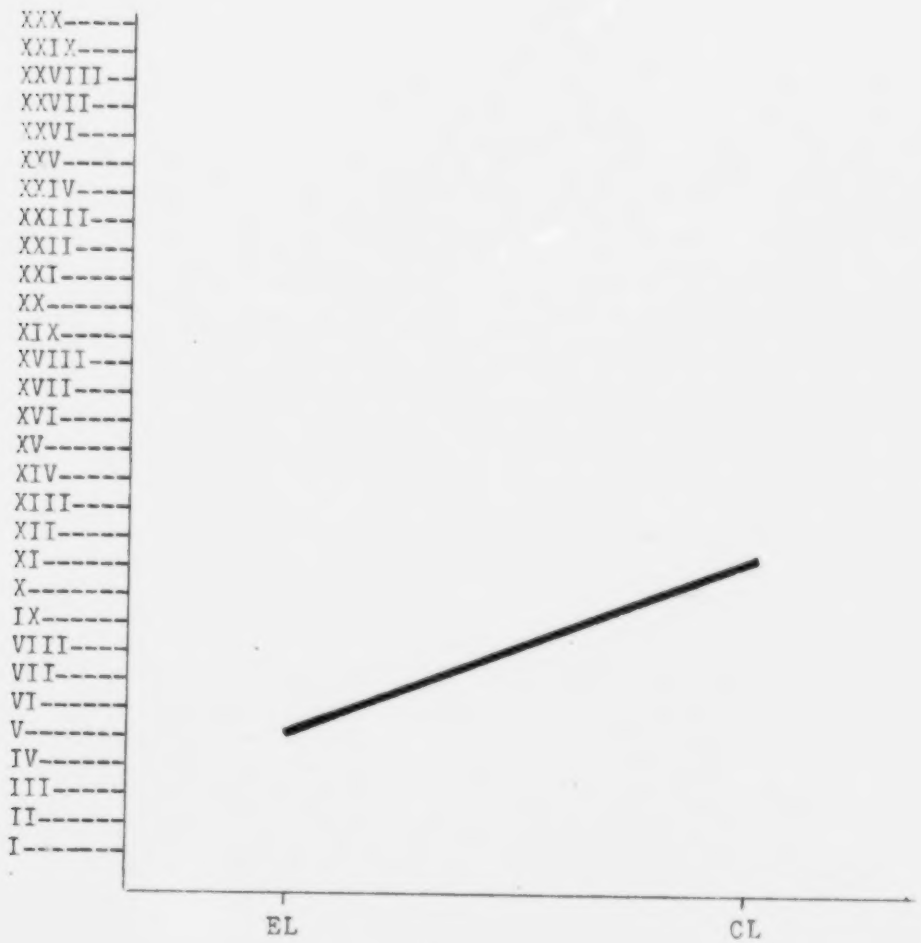
Results for Individual Patients

Name of Patients	Entering Level	Current Level	Number of Level Achievements	Number of Sessions	Total Number of Minutes	Total Number of Interactions
Elgin	IV	XVIII	14	11	97	424
Susan	IV	XVI	12	30	263	1,119
Alex	XI	XXVIII	17	29	275	1,630
Missy	X	XII	2	22	213	619
Michelle	VI	XI	5	17	130	623
Kathy	V	VIII	3	20	193	934
Allan	III	VIII	5	12	110	210
Kevin	III	VI	3	13	97	189
Craig	III	VII	4	21	177	485
Joey	V	IX	4	21	166	878
Louise	III	IX	6	27	121	288
Debbie	VIII	XIV	6	24	196	715
Steven	III	VII	4	13	38	178
Patty	III	XVIII	15	30	235	1,619
Ian	V	VII	2	2	13	60
David	III	X	7	22	116	629
Cathy	VIII	XIII	5	18	99	446
Hubertus	VIII	XVII	9	37	330	1,011
Paul	III	VII	4	16	103	339
Mark	V	IX	4	21	112	421

Graph I

Mean Achievement Across Patients

Record of Level Achievement



EL (Entering Level):

Basic Interaction V

CL (Current Level): XI

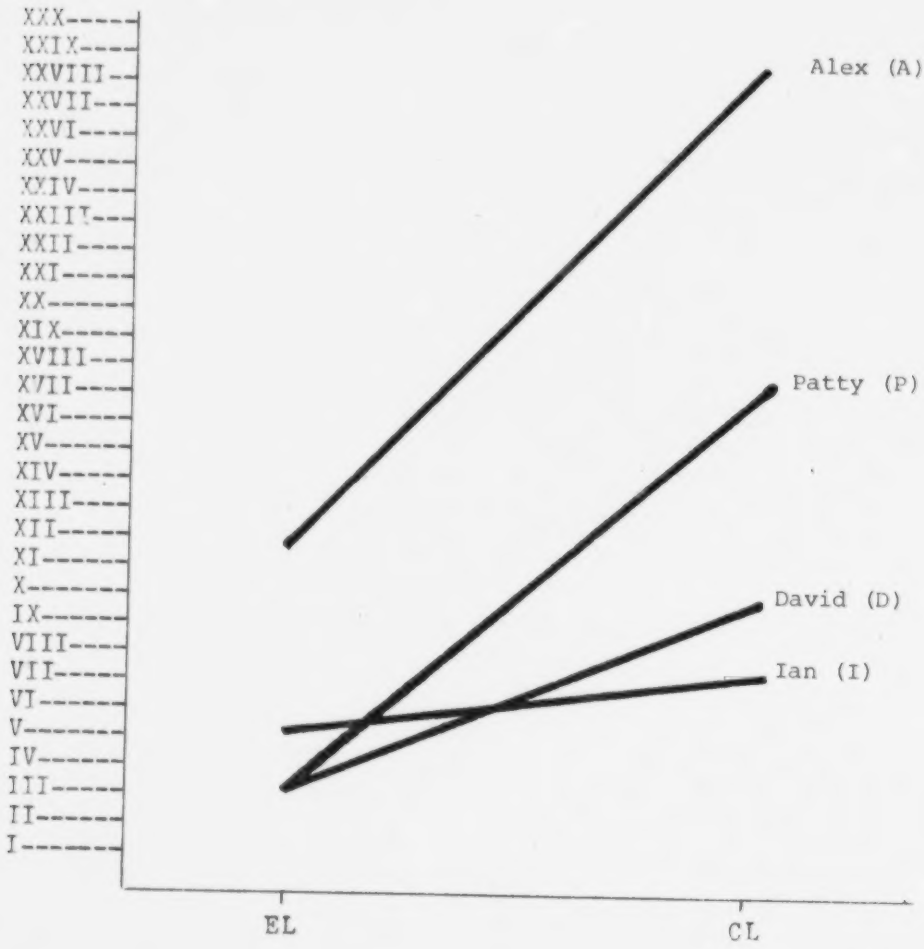
Matching Objects

From EL to CL:

Mean	Number of Sessions:	20.3
Mean	Number of Minutes:	154.2
Mean	Number of Level Achievements:	6
Mean	Number of Interactions	640.85

Graph 2

Level Achievements for Sample Patients



EL (Entering Level):

A	P	D	I
XI	III	III	V

CL (Current Level):

A	P	D	I
XXVIII	XVIII	X	VII

From EL to CL:

	A	P	D	I
Total Number of Sessions:	29	30	22	2
Total Number of Minutes:	275	235	116	13
Total Number of Level Achievements	17	15	7	2

Discussion

The findings indicate strongly that the diagnosis of mental retardation does not signify an innate inability to achieve standard performances but must rather be regarded as being function of little or no previous teaching. Teaching must be defined as that activity which brings about learning.

Particularly noteworthy is the teaching time that was necessary to establish the performance increments. For the mean of 6 performance levels a mean total time of 154 minutes was used. This extremely short time span supports the assumption that the performance increment was not due to maturation or some developmental factor. It also indicates strongly that children who are diagnosed as being mentally retarded cannot be considered to be "learning-retarded", that is, in a situation where "non-random" teaching occurs, and where the teaching steps are arranged in a sequential hierarchical fashion, these children will learn. The speed of performance acquisition seems comparable to that of "normal" children.

Graph 2 presents several sample cases: Alex, the patient with the highest number of level achievements (17) also received a high number of sessions (29). Ian, the patient with the lowest number of level achievements (2), received the lowest number of sessions (2). Ian was ill during a major part of the program. Patty and David started from the same Baseline (Level III). Patty achieved 15 levels. David achieved 7 levels; but Patty received 30 sessions. David received only 22 sessions.

It seems that number of level achievements (amount of behavioral increments) is function of number of sessions and thereby function of time and number of interactions if interactions are sequentially and consequently arranged.

Teaching and learning success in such a case is contributable to the program rather than the individual "teacher". Teaching in this programatic fashion seems to guarantee learning.

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